Turbo

TMS Series Users Manual

TMS SERIES USERS MANUAL

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UNPACKING

As part of our system of quality control, every Turbosound product is carefully inspected before packing to ensure flawless appearance. After unpacking your enclosure, please inspect for any physical damage, and save the shipping carton and all relevant packing materials in case the unit again requires packing and shipping. In the event that damage has been sustained, notify your dealer immediately so that a written claim to cover the damages can be initiated.

WARRANTY

This enclosure is warranted by Turbosound to the original purchaser, against defects in workmanship or faulty materials used in manufacture, for a period of two years from the date of shipment. Faults due to purchaser misuse, unauthorised modifications or accidents, are not covered by this warranty. No other warranty is expressed or implied.

In the unlikely event that your unit is faulty, it should be sent, shipping prepaid, to an Authorised Dealer, or direct to Turbosound, stating the faults as found. The serial number must be quoted in any correspondence relating to this warranty.

INTRODUCTION

Thank you for purchasing a Turbosound system.

Over the last few years, there has been an ever-increasing awareness of the availability of high quality sound (F.M. car radios, compact discs). Concert and theatre-goers and indeed audiences in general at all types of functions where music or speech is involved, are coming to expect a high quality of sound reproduction.

At Turbosound we have always felt that the audio quality of a high power sound system must be such that the system becomes "transparent" and does not detract from the quality of a performance. Indeed, the performer's abilities should be augmented by the facility to reach larger audiences whilst maintaining the intimate psycho acoustic quality of closeness to the stage. There are a number of factors inherent in the design of Turbosound

enclosures that allow the system designer to maximise this approach to sound reinforcement.

Turbosound sound reinforcement products include a number of unique, patented features which enable these enclosures to offer a combination of high-power capability with extremely low distortion, exceptional frequency response and transient-handling, in unusually compact enclosures.

To make the best use of these capabilities, the system must be operated correctly. The intention of this user manual, therefore, is to indicate system considerations which will enable you to maximise the performance of your Turbosound product.

If you have any questions which are not covered in this manual, or you have observations which you feel would be useful to other Turbosound users, please contact your dealer.

OVERVIEW

Your Turbosound enclosures are only one link in the chain which forms the entire system. Each of the links in that chain must reach the same, high standard, and should complement the standards of the enclosure.

Two fundamental concepts should be borne in mind when setting up a Turbosound system:

Firstly, Turbosound units are basically of the "point and shoot" variety, offering carefully-tailored dispersion characteristics. Whilst bearing in mind the fact that adjacent enclosures will influence each other, the idea of aiming the cabinets more-or-less where the sound is required to go, will provide a good starting point for the setting-up of these enclosures.

Secondly, Turbosound systems do have some unconventional qualities which set them apart from ordinary loudspeakers. Although this manual advises the use of various test instruments, listening to the system (i.e. using your ears!) is probably the best final assessment.

AMPLIFICATION & SYSTEM PROTECTION

Turbosound enclosures should be driven by professional-quality amplifiers capable of providing adequate headroom when operating at high levels, to preserve the transient response of the enclosure. An amplifier with insufficient drive capability will not allow the full performance of the unit to be realised.

It is difficult to overdrive a Turbosound enclosure, and within reasonable limits the recommended amplitier power can be exceeded without fear of damaging the units. However, damage will certainly be sustained if the amplifier is driven into clip for any extended period of time.

FIG 1

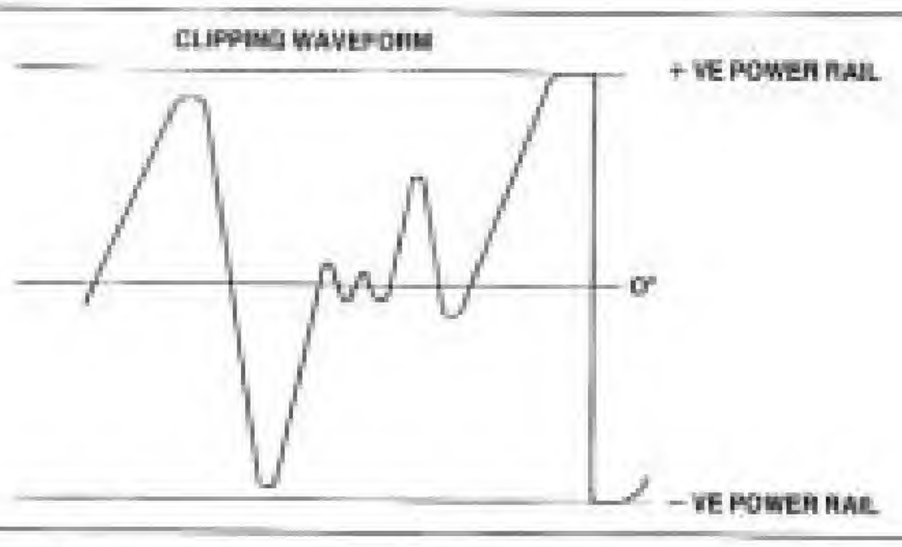


Figure 1 shows clipping caused by overdriving the amplifier. If this clipped signal is fed to a loudspeaker, it will not only detract from the sound quality, but may cause permanent damage (clipped wave forms are like short bursts of D.C. and tend to heat up the speaker voice coil by driving it out of the magnet gap). Some amplifiers have "soft clip" characteristics which round off the edges of clipped wave forms. However, a limiter or crossover with limiting built in will stop amplifier clipping and ensure a long life from your enclosures.

Note: Limiters must be adjusted to suit amplifier sensitivity. Refer to limiter or crossover manufacturers' literature.

The amplifier requirements for the TMS Series are as follows:

TMS-1

The TMS-1 is passive and should be driven by a professional-quality amplifier capable of supplying 250 watts RMS continuously into an 8 ohm load.

TMS-2

The TMS-2 is designed for bi-amping and should be driven by a professional-quality amplifier capable of supplying 250 watts RMS continuously into an 8 ohm load, and 150 watts RMS continuously into a 16 ohm

load. If fitted with an optional external **XPX-2** passive crossover system, the TMS-2 should be driven by a professional-quality amplifier capable of supplying 300 watts RMS continuously into an 8 ohm load.

TMS-3

The TMS-3 is designed for tri-amplification, and should be driven by professional-quality amplifiers capable of performing as follows:

Driver section	Amp power (RMS Watts)	Impedence (Ohms)
Bass	500	4
Mid	250	8
High	100	8

TMS-4

The TMS-4 is designed for bi-amping and should be driven by a professional-quality amplifier capable of supplying 300 watts RMS continuously into an 8 ohm load, and 150 watts RMS continuously into a 16 ohm load.

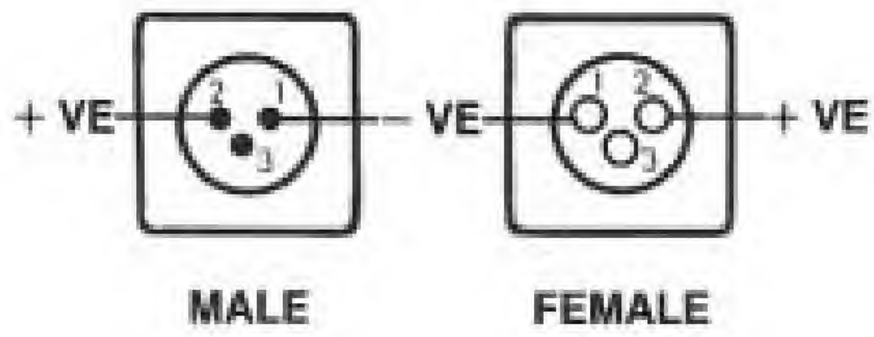
CABLING

The recommended wire size for the majority of applications is 2.5 sq. mm (12 gauge). This will be perfectly satisfactory under normal conditions. For reference, acceptable performance will be obtained with an absolute minimum of 1.5 sq. mm (14 gauge), assuming that the amplifiers are in close proximity to the speakers. In the case of runs in excess of 100 feet or so, the wire size should exceed this. See following table for further information.

GUIDE TO POWER LOSS IN CABLES

CABLE RUN IN METRES	CROSS SECTIONAL AREA OF EACH CONDUCTOR (mm)	CABLE RESISTANCE IN OHMS	~~GUIDE TO~~ PERCENTAGE ~~POWER LOSS~~ INTO 8Ω LOAD (%)	POWER AVAILABLE AT SPEAKER PERCENTAGE POWER LOSS INTO 4Ω LOAD (%)
2·5	1·0	0·086	1·1 97·9(98)	2·2 95·8
	1·5	0·058	0·73 98·6(98·5)	1·5 97·2
	2·0	0·043	0·54 98·9(99)	1·1 98
	2·5	0·035	0·44 99·1(99·1)	0·09 99·3
	4·0	0·021	0·20(99·5)	0·55 99
5	1·0	0·173	2·2 95·8	4·3 91·9
	1·5	0·115	1·4 97·2	2·9 94·5
	2·0	0·086	1·1 97·9(98)	2·2 95·8
	2·5	0·069	0·86 98·3	1·7 96·6
	4·0	0·043	0·54 98·9	1·1 97·9
10	1·5	0·230	2·9 94·5	5·8 89·4
	2·0	0·173	2·2 95·8	4·3 91·9
	2·5	0·138	1·7 96·6	3·5 93·4
	4·0	0·086	1·1 97·9	2·2 95·8
	6·0	0·058	0·73 98·6	1·5 97·2
25	1·5	0·575	7·2 87·0	14·0 76·4
	2·0	0·431	5·4 90·0	11·0 81·5
	2·5	0·345	4·3 91·9	8·6 84·7
	4·0	0·216	2·7 94·8	5·4 90
	6·0	0·144	1·8 96·5	3·6 93·2
50	2·0	0·863	11·0 81·5	22·0 67·7
	2·5	0·690	8·6 84·7	17·0 72·7
	4·0	0·431	5·4 90	11·0 81·5
	6·0	0·288	3·6 93	7·2 87
	10·0	0·173	2·2 95·8	4·3 91·9
100	2·0	1·73	22·0 67·7	43·0 48·8
	2·5	1·38	17·0 72·7	35·0 55·3
	4·0	0·863	11·0 81·5	22·0 67·7
	6·0	0.575	7·2 81	14·0 76·4
	10·0	0·345	4·3 91·9	8·6 84·7

FIG 2



CONNECTIONS

There is a great deal of controversy as to the "correct" wiring of XLR-type connectors, especially when they are used for amplifier output applications - several wiring conventions are used. Turbosound have followed the method most commonly found in the sound reinforcement industry internationally, but special care should be given to this area. See Figure 2.

In the Turbosound TMS-1/2/4 enclosures the connectors are wired as follows:

Pin	Name	Polarity	Colour
1	Ground/Common	-	Black/Blue
2	Hot	+	Red/Brown
3	Not connected	N/A	N/A

TMS-1

The TMS-1 is a passive 3-way enclosure and is fitted with two 3-pin XLR-type connectors, one male and one female.

TMS-2

The TMS-2 is a bi-amped* 3-way system.

Each section (Bass; Mid/High) of the enclosure is fitted with two 3-pin XLR-type connectors, one male and one female.

* There is an optional passive add-on unit, the **XPX-2**, which fits on to the outside rear of the TMS-2 enclosure.

TMS-3

The TMS-3 is tri-amped 3-way and is fitted with two 6-pin Cannon EP-6 connectors; one male fitted to a 6' six-way cable, and one panel-mount female.

The EP-6 connectors are wired as follows:

Pin 1: Bass - Pin 2: Bass +
Pin 3: Mid - Pin 4: Mid +
Pin 5: High - Pin 6: High +

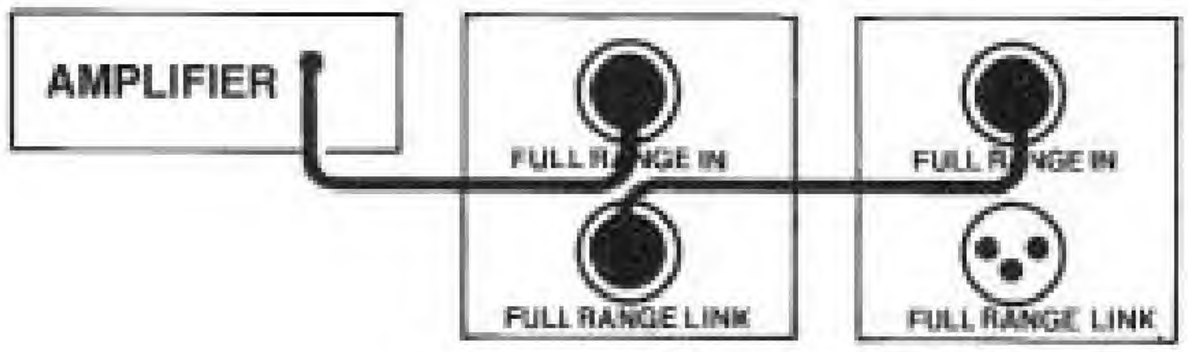
TMS-4

The TMS-4 is a bi-amped 3-way system.

Each section (Bass; Mid/High) of the enclosure is fitted with two 3-pin XLR-type connectors, one male and one female.

NB In all cases the male and female connectors are wired in parallel, so that either may be used as the input to the system, the second then being available for "daisy-chaining" to a second enclosure. See Figure 3.

FIG 3



CROSSOVERS

TMS-1

The TMS-1 has an internal passive network, optimised for minimum phase shift at the crossover points. As a result, no external crossover is required for this unit, unless it is used with a sub-woofer enclosure.

TMS-2

A 24dB/octave two-way active crossover is required* for these units. The recommended crossover point is 250 Hz.

It should be noted that the midrange loudspeaker (part of the Mid/High section) is wired internally 180 degrees out of phase with respect to the Bass and HF drivers. Experience has shown that this gives the best response with the majority of crossovers.

* There is an optional passive crossover available as an add-on unit, the **XPX-2**, which fits on to the outside rear of the TMS-2 enclosure.

TMS-3

A 24 dB/octave three-way active crossover is required for this unit. The recommended crossover points are 250 Hz and 3.7 kHz.

It should be noted that the Mid and High sections are wired internally 180 degrees out of phase with respect to the Bass. Experience has shown that this gives the best response with the majority of crossovers.

TMS-4

A 24dB/octave two-way active crossover is required for these units. The recommended crossover point is 250 Hz.

NOTE: If ultra-low frequency projection is desired, a sub-woofer enclosure may be added, e.g. the Turbosound TSW-124. The table below shows the crossover point and the type of crossover required. In all cases this crossover should be 24dB/octave.

	Crossover Point	Crossover Type
TMS-1	100Hz	Two-way
TMS-2	80Hz	Three-way
TMS-3	80Hz	Four-way
TMS-4	80Hz	Three-way

N.B. In the case of the TMS-2/3/4, the sub-bass filter may be a low pass type and the 15" or 18" units can be allowed to go down to 30Hz. In this case the use of a 24dB/octave crossover incorporating phase correction is advisable.

EQUALISATION

An important point to remember with Turbosound enclosures is that they are designed to need no equalisation or correction to overcome system limitations. As a result, they will require equalisation to compensate only for aspects of the acoustic environment.

Over-equalisation introduces phase distortion and can reduce system headroom, causing more problems than it

cures. EQ should be applied gently and smoothly, and a 1/3 or 1/2 octave graphic equaliser will generally be quite sufficient. Turbosound enclosures are phase-coherent designs, and violent equalisation will be detrimental to the overall sound quality.

POLARITY CHECKING

All Turbosound units are shipped wired as stated above. However, with a number of different types of amplifier and wiring runs used in many systems, polarity inconsistencies may be created.

There are two basic methods of checking that the polarity of the system is correct. You can use either, or both methods. With the TMS-1, it is necessary to use these procedures only if the system comprises more than one enclosure per side, in the case of an array, or if wiring problems are suspected.

The first method utilises a third-octave analyser and pink noise generator.

Start by disconnecting all but one of the enclosures. With this remaining loudspeaker set up correctly, as far as is known, feed the pink noise signal into the system and adjust to a suitable level for measurement. Place the measurement microphone a few feet in front of, and on axis between, the first cabinet and the adjacent unit in the array. Now connect the adjacent unit. The analyser display should jump up in level, particularly in the lower frequencies, indicating that the two cabinets are correctly connected with respect to each other. If they are INCORRECTLY connected, there will be a good deal of cancellation. Proceed along the array, moving the microphone to a point on axis between the last tested unit and the next in the array, until all cabinets have been checked.

The second method is to use a pulse-based polarity checking device, such as the Turbosound TPC-1151. This consists of a pulse generator (PG-11) that can be fed into the system, and a pulse detector (PD-51) which is used to monitor the polarity of the elements of the system.

Individual cabinets should be checked before setting up, and the complete system checked for overall polarity coherence after assembly. When using a phase-checker, bear in mind that meaningful results will be obtained only by comparing the same frequency section of the different units.

When checking a TMS Series cabinet with the TPC-1151 or similar, their "acoustic polarity" should be as follows:

	Bass	Mid	High
TMS-1	Positive (+)	Negative (-)	Positive (+)
TMS-2	Positive (+)	Negative (-)	Positive (+)
TMS-3	Positive (+)	Negative (-)	Negative (-)*
TMS-4	Positive (+)	Negative (-)	Negative (-)

* This remains the same whether the TMS-3 is fitted with a 2" or V-2 HF driver.

Please note: These are relative values only and do not relate to the absolute phase of the system, so they may be in reverse order.

The complete system can be tested by checking that the same driver sections of adjacent cabinets have identical polarity.

If there appear to be problems, check the cable wiring in the first instance. Also bear in mind that different amplifier manufacturers use different pin configurations and polarity conventions; if you are using amplifiers from more than one manufacturer, check the polarity of the amplifiers as well as the cabinets.

It should be noted that correctly-configured cabinets in a multiple array will load one another: if one or more cabinets are connected with the wrong polarity, they may damage the system if the mistake is not discovered. In addition, the system will not, of course, give its best performance.

PHASE ALIGNMENT

In order to assist in obtaining accurate acoustical summation of the signals from adjacent speaker units in a loudspeaker system, (e.g. between a TMS Series enclosure and an additional sub-woofer system), it is desirable to be able to adjust the phase of the signal from one frequency band to that of the next frequency band. To facilitate these adjustments, an electronic crossover with a phase correction system will be required. This will properly allow for any phase errors that may occur between the positions of the cabinets themselves.

OPERATION & APPLICATIONS

In the past, it has often been the case that an enclosure may sound good on its own, but as soon as two or more are placed next to each other to increase the dispersion, available power handling or SPL, the tonal balance changes, usually to the detriment of the sound. Patterns of sound waves leaving adjacent components interact to produce comb filtering (see Figure 4), when the listener moves off the axis of the array. These effects are most noticable in the mid and high frequencies so crucial to the perceived sound image.

FIG 4

PROBLEMS ASSOCIATED WITH LOW DIRECTIVITY SOUND SOURCES

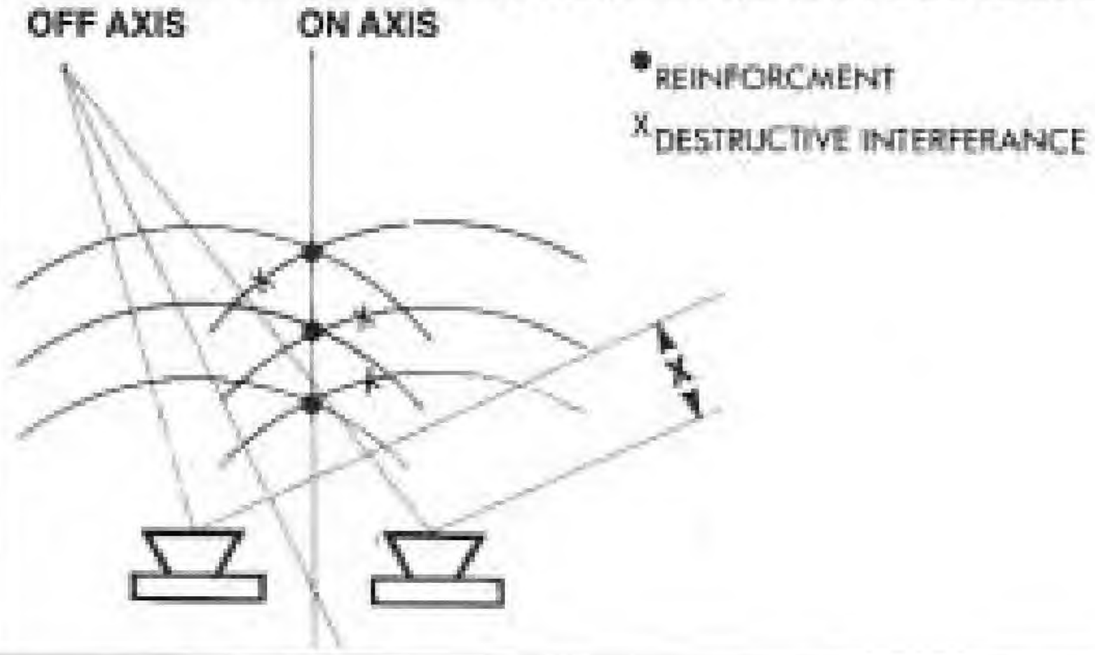
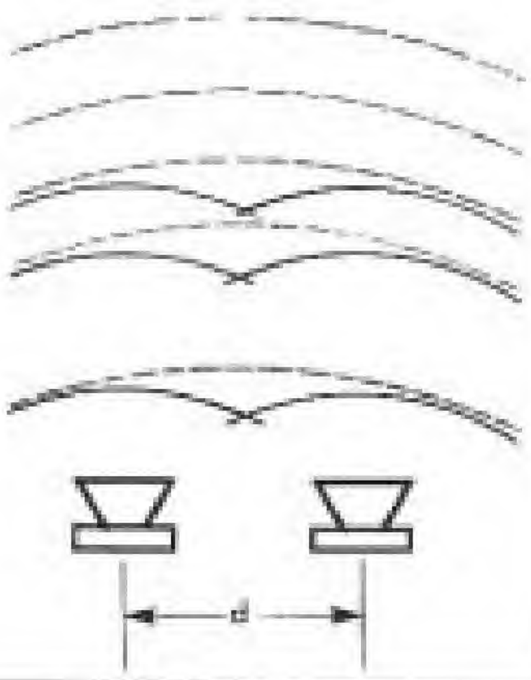


FIG 5



In the lower frequencies however, wave lengths are long enough to produce coupling, and adjacent enclosures positively reinforce each other to give substantial gains in directivity and projection (see Figure 5).

The gradual increase in directivity with rising frequency inherant in all Turbosound designs is a very positive benefit. When a system is arrayed in order to cover more than the nominal dispersion available from one enclosure, although the bass and low mid frequencies reinforce each other, in the crucial upper-mid and highs, there is limited coupling but greater inherant projection from the individual units. This gives the listener an impression, even with large systems, that there is just one speaker. This is the real benefit of point source theory when applied to high directivity components.

As can be seen from Figure 4, the two speakers only really add at all frequencies when the listener is on axis. Off axis, the frequency at which 'x' is half a wavelength, will be cancelled along with its harmonics, in varying amounts. This is a "comb filtering" type effect.

Where wavelength is substantially longer than 'd' (see Figure 5), directivity and projection are increased without "combing".

Efforts have been made by other speaker designers to solve these problems with compression drivers on constant directivity horns. But none can be used at high levels in the mid band or "vocal range" without severe distortion. The consequent unnatural sound quality and listening fatigue that results can be extremely aggravating and even painful to the listener.

At Turbosound we believe that distortion, not SPL, produces listening fatigue and poor intelligability. For this reason the TurboMid™ device was designed to replace compression drivers in the mid-range. By relying on compression devices only in the higher frequencies they are then subject to less stress and become both sweeter sounding and more reliable.

Furthermore, the substantially plane wavefront generated by Turbosound enclosures means that there is less attenuation with distance. Put simply, the same sound quality is available to the listener whether located at the front or the back of the auditorium. Less stray sound is reflected from walls and ceiling, and equalisation for room reflections is minimised.

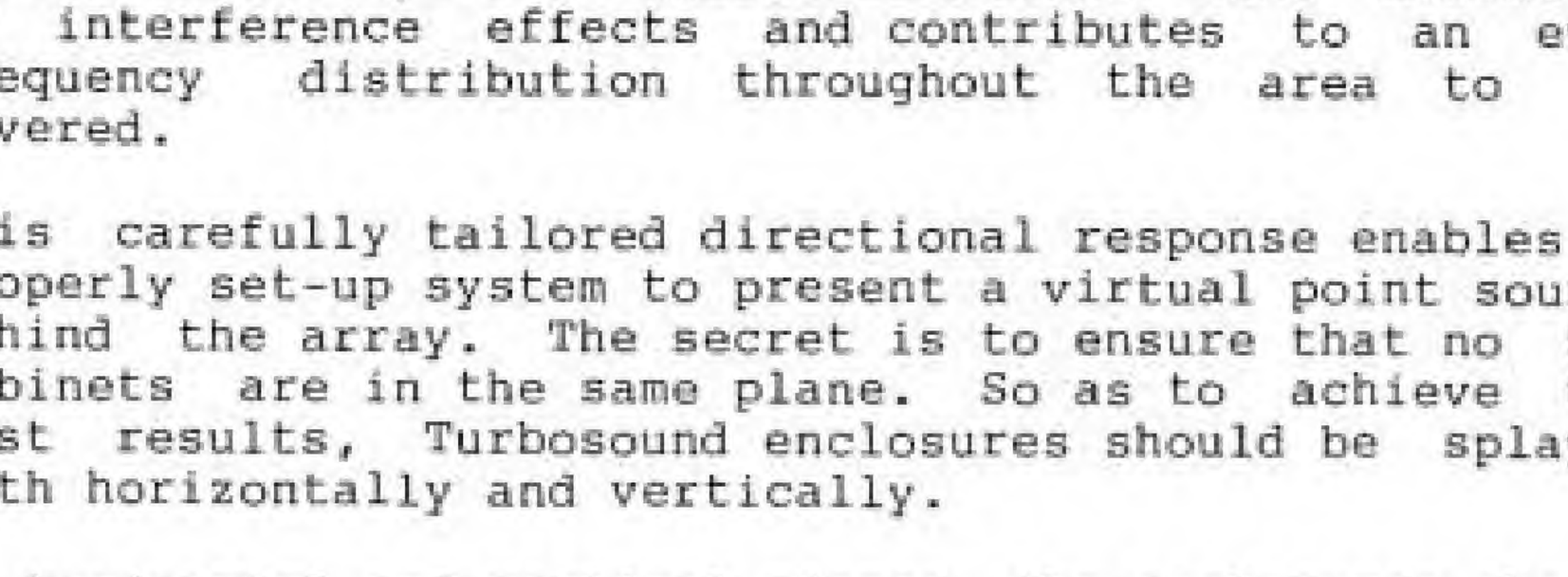
Turbosound enclosures are particularly effective in an array configuration, and the cabinets are designed to offer the system designer maximum flexibility as regards both stacking and flying.

The key to successful array configurations is to bear in mind that all TMS Series enclosures have highly directional dispersion characteristics. This minimises HF interference effects and contributes to an even frequency distribution throughout the area to be covered.

This carefully tailored directional response enables a properly set-up system to present a virtual point source behind the array. The secret is to ensure that no two cabinets are in the same plane. So as to achieve the best results, Turbosound enclosures should be splayed both horizontally and vertically.

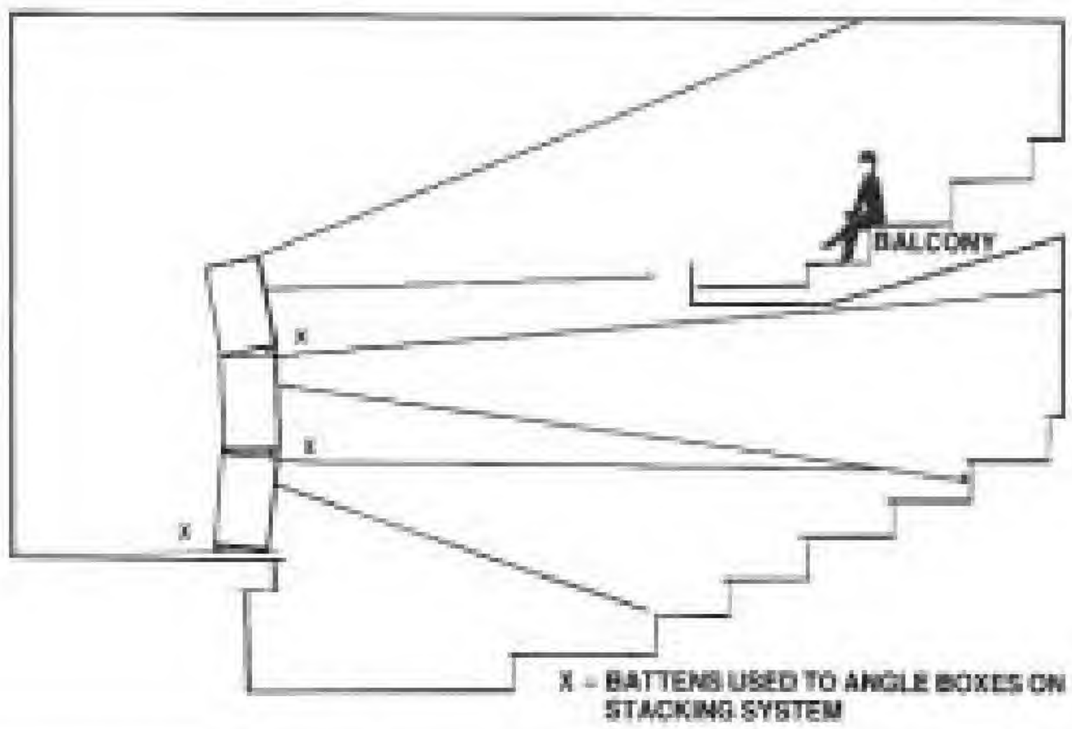
In horizontal and vertical planes, the enclosures should be splayed to form a fan. See Figure 6.

FIG 6



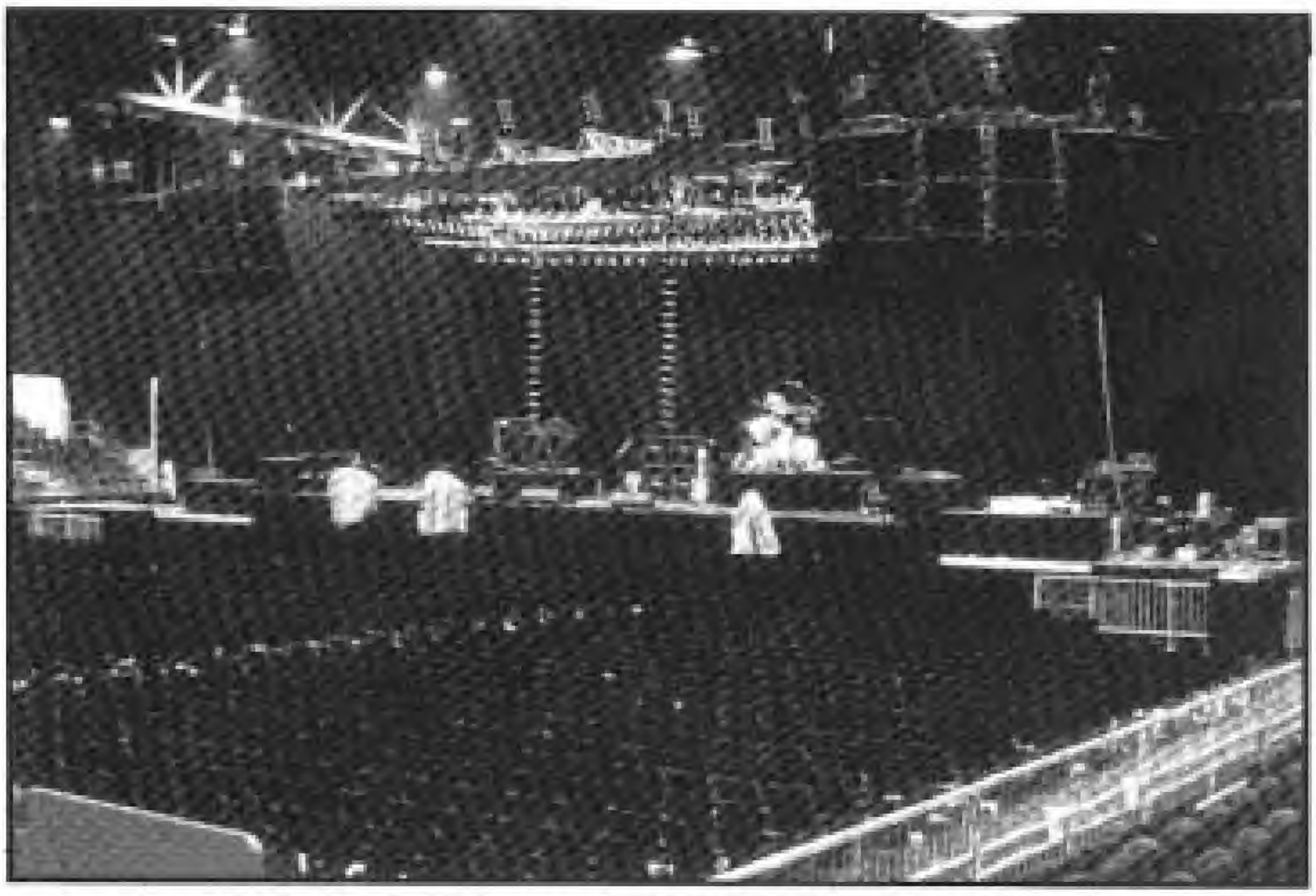
$\triangle$ = 10-30^{o} optimum, depending on projection required. For high power or outdoor shows, the angle could be less.

FIG 7



In stacked systems, vertical angle accuracy can be ensured by using battens between adjacent cabinets (See Figure 7). To maintain phase coherency, the rear edges of the enclosures should touch each other, so as to create a virtual point source.

Using the optional ring-type flying points on the top and rear of the TMS-1/2/4 enclosures, a highly versatile flying system may be formed. The principles of achieving successful dispersion are identical to those for stacking.



Turbosound TMS-3 enclosures and FB-300 flying bars in use at the National Exhibition Centre, Birmingham, U.K.

The TMS-3 is usually supplied in matched pairs of "left-handed" and "right-handed" cabinets. Therefore it is possible to introduce coupling between adjacent cabinets at the Bass or in the Mid/High sections by placing the appropriate driver sections next to each other. It is more usual to couple the Bass end: If the Mid/High

drivers are adjacent there may be too much high frequency energy produced on axis, especially if the angles between cabinets are small. The amount of coupling introduced depends on the combination of throw and spread required.

Vertical as well as horizontal splaying is important - especially when three or four cabinets are stacked vertically - to avoid excessive 'beaming' of the Mid and High frequency energy. Vertical splaying is achieved by using battens between adjacent cabinets. To maintain phase coherency, the rear edges of the enclosures should touch each other, so as to remain in the same plane.

Using the special Turbosound flying plates mounted to each side of the enclosure (and, optionally, the complete Turbosound FB-300 flying system*), the units will form a highly versatile flying system. The principles of achieving successful dispersion are similar to those for stacking.

* The FB-300 is a Turbosound-designed and built flying bar with full U.K. government certification, which will hang up to 8 TMS-3's. It allows a flown system to be from 1 to 4 cabinets high and 2 wide. Three different horizontal angles may be used between cabinets: 10, 20 or 30 degrees. It may be supplied as the FB-312, which includes the bar, steels and safeties, and hardware for flying 6 enclosures.

IMPORTANT NOTE

When using TMS-1 enclosures, it should be remembered that their frequency response is tailored for applications which do not require a great deal of amplitude below 100Hz.

GLOSSARY

AMPLITUDE - Refers to the voltage level or intensity of a signal, and is usualy measured in volts or decibels.

COMB FILTERING - The additive and subtractive interferance between multiple sound sources of low directivity

DAMPING FACTOR - Tendency of amplifier to exert control over speaker, preventing overshoot and spurious resonance. Higher damping factors don't necessarily sound better. It's always best to keep speaker cables as short as possible or the system will tend to sound "loose" and ill defined. (see chart in CABLING section)

dB - A unit for expressing the ratio between two signal levels for comparison purposes. On its own it has no "absolute" level and is used for logarithmic scaling e.g. you have to be aware of the mean point of measurement. Positive numbers indicate an increase and negative ones a decrease. Some useful ratios are:

3dB = double power
6dB = double amplitude or quadruple power
10dB = triple amplitude or ten times power
20dB = ten times amplitude or hundred times power

DISTORTION - Refers to any modification of a signal which produces new frequency components not present in the original. Harmonic distortion refers to added frequencies that are overtones to the fundamental frequency. Intermodulation distortion refers to added frequencies that are sum and difference values derived from the beating together of two frequencies.

EQUALISATION - Modification of the frequency response of an audio system, regardless of level, for corrctive or enhancement purposes.

FREQUENCY - The repetition rate of a waveform. The unit of frequency is Hz, and 1 cycle per second is equal to 1 Hz. The audio band is generally restricted to frequencies of 20 Hz to 20,000 Hz (20 - 20 kHz).

FREQUENCY RESPONSE - Refers to the relative gain of circuits at all-frequencies across its usable band. Generally expressed as +/- a certain number of dBs from 20 Hz to 20 KHz.

HEADROOM - The amount, in dBs, above normal operating level that can be used before serious distortion commences.

IMPEDANCE - The AC equivalent of resistance and measured in ohms. It indicates the drive capability of an output, or the amount of drive required for an imput, at any given signal level.

LEVEL - The amplitude of a signal, measured in volts or decibels.

OCTAVE - A logarithmic unit for expressing frequency ratios. Positive values indicate an increase in frequency and negative ones a decrease. One octave is equivalent to double or half frequency.

PLANE WAVEFRONT - Theoretically, a completely plane wavefront device would have zero dispersion and infinite projection.

PSYCHO ACOUSTICS - The subjective effects of sound on the mind of the listener.

SOUND IMAGE - This refers to the imagined perspectives of a sound source. For example, with your eyes closed a voice should sound human and as though it is coming from a particular point. If it doesn't, the system is likely to be badly set up. High directivity usually brings the apparent image closer.

TRANSIENT - A sudden burst of energy in an audio signal which only lasts for a small period of time relative to the rest of the signal. The level of these transients can often reach 10 times or so the normal operating level of the audio equipment, and may cause distortion.

VIRTUAL POINT SOURCE - The point in space at which the axes of the speakers in an array cross. This will be the point from which the sound appears to originate.

FIGURES

1: Clipping waveform

2: XLR connections

3: Daisy-chaining cabinets

4: Off-axis comb filtering. Mid and high frequencies

5: Reinforcement of bass frequencies

6: Virtual point-source and two examples of possible system configurations

7: Vertical angling of stacked array

TMS SERIES OPTIONS AND ACCESSORIES

MODEL	DESCRIPTION

Flying and Lifting Hardware

RT-767	3 pcs flying rings
FB-300	TMS-3 flying bar
FB-312	1x FB-300, 4x SD-460S, 12x SD-460L, 2x TS-300
DR-460	'D' ring
FP-460	FlyPlate
SD-460S	Steel + 'D' ring (short)
SD-460L	Steel + 'D' ring (long)
TS-300	Tilting strap

Heavy Duty Padded Covers

HDP-1	for TMS-1
HDP-2	for TMS-2
HDP-3	for TMS-3
HDP-4	for TMS-4
HDP-124	for TSW-124

Heavy Duty Nylon Covers

HDN-1	for TMS-1
HDN-2	for TMS-2
HDN-3	for TMS-3
HDN-4	for TMS-4
HDN-124	for TSW-124

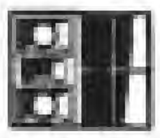
Cannon AP Series Connectors

AP-6-11	6 pin female cable
AP-6-12	6 pin male cable
AP-6-13	6 pin female panel
AP-6-14	6 pin male panel

THE TURBOSOUND RANGE

TMS-1 – Full-range enclosure • passive 3-way • 250 Watts RMS • Frequency response 90Hz-17kHz +/–3dB • Dispersion 70°H x 70°V at – 6dB Points 610mm H x 432mm W x 451mm D.

TMS-2 – Full-range enclosure • bi-amped 3-way (XPX-2 passive module available) • 400 Watts RMS • Frequency response 65Hz-18kHz +/– 3dB • Dispersion 70°H x 70°V at – 6dB Points 865mm H x 432mm W x 578mm D.



TMS-3 – Full-range enclosure • tri-amped 3-way • 800 Watts RMS • Frequency response 55Hz – 20kHz +/– 4dB • Dispersion 70°H x 50°V at – 6dB Points 844mm H x 1019mm W x 578mm D.

TMS-4 – Full-range enclosure • bi-amped 3-way • 450 Watts RMS • Frequency response 45Hz – 18kHz +/– 3dB • Dispersion 70°H x 60°V at – 6dB Points 1143mm H x 502mm W x 730mm D.

TSE-260 – High frequency enclosure • 100 Watts RMS • Frequency response 2kHz – 20kHz +/– 4dB 267mm H x 451mm W x 480mm D.

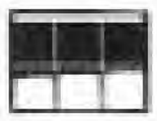
TSE-111 – Mid-high enclosure • passive 2-way • 150 Watts RMS • Frequency response 250Hz – 18kHz +/– 3dB 503mm H x 453mm W x 487mm D.

TSE-211 – Mid-high enclosure • switchable bi-amped /passive 2-way • 300 Watts RMS • Frequency response 250Hz – 20kHz +/– 4dB 842mm H x 450mm W x 481mm D.

TSE-115 – Bass enclosure • 250 Watts RMS • Frequency response 65Hz – 500Hz +/– 3dB 578mm H x 430mm W x 578mm D.

TSE-215 – Bass enclosure • 500 Watts RMS • Frequency response 60Hz – 500Hz +/– 3dB 575mm H x 844mm W x 578mm D.

TSE-118 – Bass enclosure • 300 Watts RMS • Frequency response 45Hz – 350Hz +/– 3dB 685mm H x 503mm W x 721mm D.



TSW-124 – Sub-bass enclosure • 600 Watts RMS • Frequency response 35-300 Hz +/– 3dB 660mm H x 1015mm W x 1010mm D.

TFM-2 – High-projection floor monitor • bi-amped 3-way • 450 Watts RMS • Frequency response 60Hz – 18kHz +/– 4dB 575mm H x 505mm W x 845mm D.

TMW-212 – Low-profile floor monitor • passive 2-way • 300 Watts RMS • Frequency response 110Hz – 18kHz +/– 3dB 308mm H x 695mm W x 416mm D.

TMW-215 – Low-profile floor monitor • switchable bi-amped /passive 2-way • 450 Watts RMS • Frequency response 90Hz – 17kHz +/– 3dB 378mm H x 894mm W x 542mm D.

TPC-1151 Phase Checker System
Full range of load tested flying and lifting hardware available for TMS and TSE Series

The TurboBass™ and TurboMid™ devices are covered worldwide by Principle Patents, and not simple design patents. The concepts embodied in their design, are, therefore, entirely unique. (See brochure for further information

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